Abstract Submitted
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Nonlinear Gyrokinetic Simulation of Electron-Driven Turbulence in HSX[1] BENJAMIN FABER, M.J. PUESCHEL, GAVIN WEIR, KONSTATIN LIKIN, JOSEPH TALMADGE, SIMON ANDERSON, DAVID ANDERSON, Univ of Wisconsin, Madison — The first nonlinear gyrokinetic simulations of plasmas in the Helically Symmetric eXperiment (HSX) are presented. Due to large electron cyclotron resonance heating (ECRH) and little ion heating, microtubulence in HSX is driven by electron dynamics and thus the simulations performed require two kinetic species. Linear growth rate calculations of plasmas at experimental parameters indicate HSX is unstable at low $k_y\rho_s$ to the Trapped Electron Mode (TEM) and the Electron Temperature Gradient (ETG) mode at high $k_y\rho_s$, especially in the core region where the normalized temperature gradient is significantly larger than the normalized density gradient. Nonlinear flux tube simulations show heat fluxes shift to smaller scales than for ion-driven turbulence, with the flux spectrum peaking at $k_y\rho_s \sim 0.9$ for TEM turbulence. Nonlinear simulations also show the evolution of zonal flows, which are a possible candidate for the nonlinear saturation mechanism. Calculation of the dependence of the saturated heat flux on the normalized electron temperature gradient provides a computational comparison with the stiffness measurements obtained in heat pulse propagation experiments.[2]

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[2]G. M. Weir, invited talk, this conference

Benjamin Faber
Univ of Wisconsin, Madison

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